Small Business Innovation Research/Small Business Tech Transfer

Novel Methods for the Flexible Ultrasound System Utilizing Augmented Reality Just-In-Time Procedural Guidance, Phase II

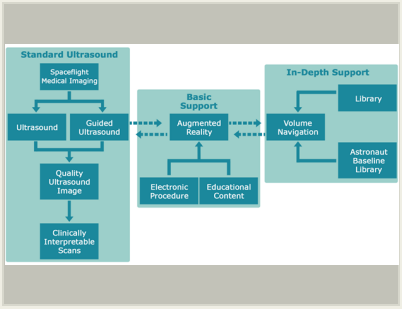
Completed Technology Project (2017 - 2022)

Project Introduction

NASA's future manned spaceflight missions will require medical diagnosis and treatment capabilities that address both the anticipated health risks and perform well in austere, remote operational environments. Spaceflight- ready medical devices will need to be capable of an increased degree of autonomous operation, acquiring clinically relevant and diagnosable data by every astronaut, not just select physician crew members credentialed in spaceflight medicine. Ultrasound is a diagnostic and treatment technology that currently fulfills mission medical capability support on ISS and is planned to accompany future deep-space missions. The Flexible Ultrasound System (FUS) is a new platform that is currently being developed by NASA and research partners to support this mission role. We propose three specific aims for this project proposal for methodological development utilizing the FUS platform: 1.) Define a list of highest priority/yield ultrasound methods to develop and implement using the FUS and our guidance prototype through careful review of the HRP roadmap and direct discussion with ExMC Physicians. 2.) Expand an Augmented Reality (AR) user interface for these ultrasound methods that provides procedural guidance in acquiring and initially diagnosing sonographic data for ultrasound procedures to enhanced degree of procedural competency. 3.) Develop and test the integration of magnetic-based Volume Navigation, and complementary dimensional referencing technologies, on the FUS platform to allow for 3-dimensional ultrasound procedural guidance through the Head Mounted Display. 4.) Integrate the current system with procedural guidance resources such as Electronic Procedures (eProc) and existing ultrasound training materials. 5.) Develop deep machine learning capabilities on the FUS platform to enable image recognition and analysis that can aid in not only quality image acquisition, but also analysis in austere, and remote operational environments.

Anticipated Benefits

This project maintains the spirit of the goals emphasized in the NASA strategy to revitalize and expand our investments in technology, commercial spaceflight, and robotic exploration precursors. NASA's multi-destination human space exploration strategy as well as its ambitious program of innovative robotics missions will challenge engineers to develop these new and complex systems with advanced capabilities. The agency is exploring multiple destinations. It plans to conduct increasingly complex missions to a range of destinations beyond low Earth orbit (LEO), including cis-lunar space, near-Earth asteroids (NEAs), the moon, and Mars and its moons. VULCAN will be one of the medical tools for the Journey to Mars in the 2030s.Tietronix has already initiated work with Methodist Houston and an NSF sponsored Cyber-systems of the future Operating Room that is an academic/industry consortium (with membership such as Medtronic, Boston Scientific and Karl Storz) on developing this technology for terrestrial medicine.



Novel Methods for the Flexible Ultrasound System Utilizing Augmented Reality Just-In-Time Procedural Guidance, Phase II Briefing Chart Image

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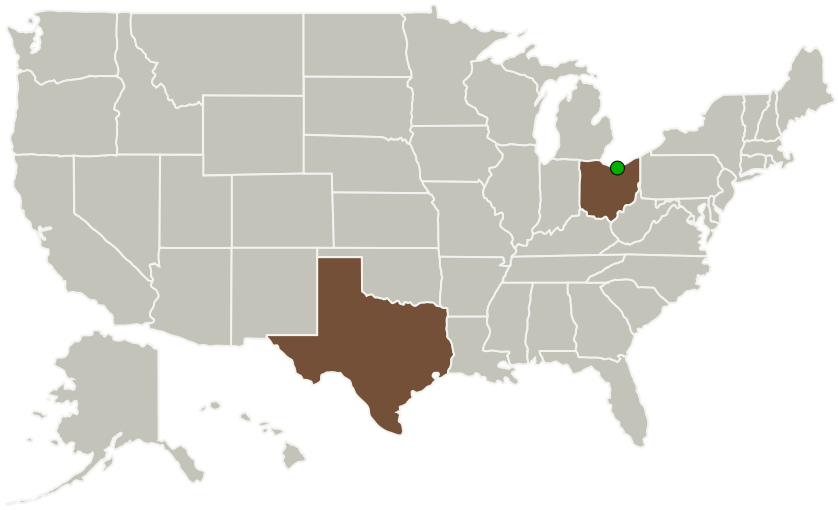
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Tietronix Software, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Houston, Texas
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Texas

Project Transitions

May 2017: Project Start

December 2020: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/141133)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Tietronix Software, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Managers:

William K Thompson
Matthew C Deans

Principal Investigator:

William Buras

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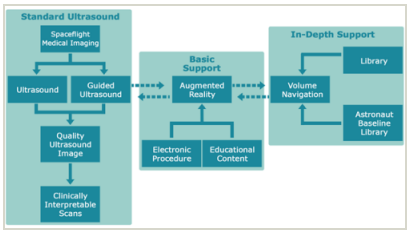
Completed Technology Project (2017 - 2022)

June 2022: Closed out

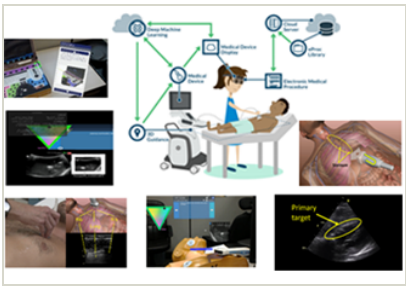
Closeout Documentation:

- Final Summary Chart PDF*(https://techport.nasa.gov/file/141132)*

Images



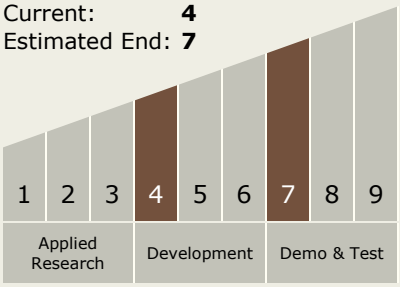
Briefing Chart Image
Novel Methods for the Flexible Ultrasound System Utilizing Augmented Reality Just-In-Time Procedural Guidance, Phase II Briefing Chart Image *(https://techport.nasa.gov/image/130880)*



Final Summary Chart Image
Novel Methods for the Flexible Ultrasound System Utilizing Augmented Reality Just-In-Time Procedural Guidance, Phase II *(https://techport.nasa.gov/image/127626)*

Technology Maturity (TRL)

Start: **4**
Current: **4**
Estimated End: **7**



Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System